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# Perceiving the Interactive Body in Dance: Enhancing kinesthetic empathy through art objects

## Abstract

Through a consideration of audience experience of embodiment in contemporary dance performance, this project used kinesthetic empathy as a theoretical construct to inform choreographic decision-making. The research outcome challenged the traditional performer/audience relationship through an interactive dance performance work entitled *Planets.* This acted as a platform that allowed both audience and performer to collaboratively listen to, process and form movement in a shared kinesthetic state. This connection was enabled through the distribution of interactive art objects, which responded to the shifting proximity between performer and audience. The performance was thus experienced through following a shared goal as instigated by the interactive technology. Through practice-led research, knowledge from kinesthetic empathy, embodied cognition and the mirror neuron system were used to develop the project's aim in encouraging interactive audiences to engage in movement. This aim influenced studio explorations of movement through an enquiry into the kinesthetic self in dance. Investigations used movement quality, tension, mobility and acceleration to access a familiar movement vocabulary appropriate for a broad interactive audience. This informed the role of the researcher as performer. *Planets* was developed as a collaborative project between Michael Smith and interactive visual designer Andy Bates and performed over three nights at the Ars Electronica Festival 2014 in Linz, Austria. Supported by documented footage from *Planets* and audience responses to the performances*,* this paper draws together the theoretical underpinnings behind the development of the work and includes the experiential perspective of the performer.

## Introduction

This practice-led research project explored the application of kinesthetic empathy theories to inform creative decision-making in a contemporary dance choreography and performance. Dance ethnologist Deirdre Sklar describes kinesthetic empathy as 'one's capacity to participate with another's movement or another's sensory experience of movement' (1994: 15-16). Studies in kinesthetic empathy define the intermodal, perceptual mechanism that is active while watching dance, so that interaction between performer and audience can be better understood. In support of this, Susan Leigh Foster states that the action of kinesthetic empathy is in moments of perception, when it appears 'as if the mover and moved are dancing together' (2011: 28). She claims empathic feelings are induced by the sensation of one person's movement in the mind of another who observes it (Foster 2011).

The research questioned how using kinesthetic empathy theories to create a choreographic work could enhance the relationship between the performer

and the audience in interactive performance. This project resulted in the creation of an original, interactive contemporary dance performance entitled *Planets* devised and performed by Michael Smith in collaboration with interactive designer Andy Bates. Smith's research was developed at Queensland University of Technology (QUT) under the supervision of Jenny Roche. The project was facilitated through a partnership between Ars Electronica Futurelab (Austria) and QUT. This partnership provided mentoring and support from designers and engineers (technicians) associated with Ars Electronica.[1] The creative work was designed to accommodate defined parameters given by Ars Electronica for inclusion in the festival; these were to develop an interactive work suitable for engagement with a large-scale ambulant audience utilizing a number of short-range FM radio receivers called the LinzerSchnitte.[2]

This practice-led research project used studio and performance process as testing grounds for working with kinesthetic empathy in dance. Empathetic response to the performance design was gathered from focus groups in the lead up to the performance and from audience members through questionnaires. In line with Henk Slager's view that 'artistic research can never be characterized by a well-defined, rigid methodology', the work was developed from a bespoke methodology that did not follow a definitive path and emerged throughout the development of the work (2009: 55). Details of this choreographic methodology will be outlined later in the paper.

Definitions of kinesthetic empathy have been developed through research within the arts, humanities and sciences. This project used such definitions in an attempt to instigate natural movement responses in audiences, which Smith tailored to create a live choreography. Dance artists and researchers leading explorations into kinesthetic empathy include Dee Reynolds and Matthew Reason (2012), along with Noel Carroll and William P. Seeley (2013). In particular, Reynolds and Reason (2012) show the diverse instances in which dance artists, psychologists and designers have used kinesthetic empathy in creative practice to enhance the experiences of the audience. This is in contrast to Carroll and Seeley's research, which gives empirical explanations that address 'the relevance of kinetic transfer to explain artistic communication and evaluation in dance' (2013: 177-178). The latter's outcomes are determined by constituting kinetic transfer in a cross-modal sensorimotor perceptual capacity as a means to explain recognized movement as motor pathways rather than indicators of an empathic, emotional response. Here, brain functions that respond to and perceive movement in various contexts are discussed to give explanation to these perceptual mechanisms.

Reason (2012) proposes that *kinesthesis,* that is the sensing of movement and position, lacks the ability to express empathy alone, as it is an intermodal form of perception that includes visual and aural aspects. Instead, a mechanism directly matching action perception and execution exists within the human brain and is referred to as the 'Mirror Neuron System' (Gallese 2008). Explanations from neuroscientific research on the Mirror Neuron System identify brain functions that are activated during the perception of

bodily movement. Through this project, Smith used knowledge on the Mirror Neuron System to create a broadly accessible and recognisable movement vocabulary. Liesbeth Wildschut revises John Martin's earlier explanations of empathic interaction by stating 'we not only watch movement, but as we are sitting in our seats, also participate in it, and so we experience the urge to imitate the dancer's movement. This imitation leads to specific kinesthetic sensations that evoke emotions linked to these movements' (2008: 238). Movement quality, tension, mobility, and acceleration all trigger 'mirror neurons' in the spectators who, correspondently, embody or muscularly sense these movement qualities within themselves (Carroll & Seeley, 2013: 177).

Wildschut (2008) explains how Giacomo Rizzolatti and his research team registered certain cell activities in the brains of monkeys that were making grabbing movements and discovered that the same neurons of the monkeys were active when watching this movement being performed by others. Tests conducted on humans found that similar brain functions in the premotor cortex (the area responsible for programing movement) are active when observing movement (Wildschut 2008: 239). Wildschut's application of research to theatre explains spectator brain function during live dance performance, thus concluding that: 'when the spectators focus on the movements of the dancers, their premotor brain area will show activity related to the observed movements' (2008: 238). Glaser (2012) states mirror neuron activity occurs not in the visual centres of the occipital cortex, but in the motor area where the brain plans complex movements, as well as in the intraparietal sulcus, a brain area responsible for visual-motor integration. Daniel Glaser's (2012) discovery that the mirror neuron system's activity level increases with an individual's familiarity to certain types of movements informed the decision for this project to choreograph through a gestural movement style that would be most accessible and familiar to a broad audience.

This project was situated in environments where audiences were actively involved. Active participation in this sense meant that audiences were encouraged to move freely through space to experience the work, rather than passively viewing from a seated position. Thus, the focus was to create an environment where the audience could perceive and perhaps even physicalise subtle movement qualities and themes. This level of active involvement invites the inclusion of embodied cognition as an important factor in the formation of the audience response. The theory of embodied cognition, which proposes that body and brain work interdependently in perception, informs how kinesthetic awareness enhances the ability to perceive and experience movement. Maxine Sheets-Johnstone (2010) refers to spatial concepts as being born in kinesthesia and in our correlative capacity to think in movement. For example, she considers the perception and cognition of proximity (near and far) as integral dimensions of our everyday lives. She writes, 'we reach for things that are reachable, we walk to something not quite within reach, and so on' (2010: 168). Here, she establishes that near and far are basically facts of body life as they are embedded in bodily experience, specifically experiences of one's kinesthetic body as well as ideas that we conceptually understand. This relationship shared by the body and space is fundamentally understood when experiencing movement. Drawing on this

knowledge, proximity played an integral part in the design of the interactive system in *Planets* as a means of calibrating audiences into thinking and perceiving through movement.

Interactive art systems have been an integral research platform for theories of embodied cognition as the role of the audience member shifts from passive to active. Steve Dixon describes the role of the audience member in digital interactive performances to differ as they 'activate, play with, affect, input into, build, or entirely change the experience' (2007: 559). Fogtmann Maiken and Dee Reynolds (2012) explain interactive systems as promoting kinesthetic empathy interaction, where the kinesthetic experience is embedded in the interplay between the participants as mediated by the system. Audience input influenced Smith's decision making in performances of *Planets*, as he was required to listen and respond to the embodied actions of others while being physically present in the self.

Brian Knoth's *Unless* (2009) is an example of a contemporary dance work that explores kinesthetic empathy by connecting people through live dance performance in a multi-sensory, perceptual interactive system. His aim was to 'provoke the audience to be more consciously aware of their perceptual relationship to a dancer' (Knoth 2012: 283). He also hypothesized that such awareness could also serve to enhance their experience of kinesthetic empathy. While Knoth's *Unless* aims to enhance kinesthetic empathy through the relationships at work, the focus of this research was to use such relationships between a performer and interactive system to shift the audience from passive to active. This shift to activity called for embodied cognition to be enhanced in the audience, to ultimately heighten kinesthetic exchange.

Sonia Cilari is another media artist and architect whose works create sensorial and perceptual mechanisms in immersive and augmented environments (Cilari, 2011). Her current research is in the field of body as interface, in contrast to Knoth's use of Nintendo Wiimotes as interface. Positioning the body as an interface means the interactive system cannot function without the presence, action and movement of the human body. This was demonstrated in her 2010-11 work, *Sensitive to Pleasure*. Cilari explains, '[I am] interested in exploring the way visitors may interact with the creature [performer] knowing that their behaviour is provoking a strong physical reaction in my body outside' (Ars Electronica Archive, 2011). Cilari's use of the physical body as an interface in interactive performance is of particular relevance to this project as it allowed her body to maintain the centre of focus within an interactive system. Furthermore, she used proximity to spatially orient visitors so that they recognize their own bodily movement while interacting with the performer.

When discussing interactive objects that utilize the body as an interface, it is also important to consider David Kirsh's (2013) explorations of embodied cognition through tool absorption. Kirsh (2013) describes embodied cognition as thought that is not confined to the brain. Because of the intimate way we are coupled to our bodies, thought may derive from body parts as cognitive components to form and shape how we think. Alternatively, when a person

uses a tool, the neural representation of their body schema changes as they recalibrate their body image to absorb the end-point of the tool (La'davas, 2002). La'davas (2012) confirms this measure through an integrated system that controls both visual and tactile inputs within peripersonal space around the hand. Thus, when the interactive objects were held in the hands of audience members, the audience was obliged to fulfil their interactive function by physically moving the objects through space and in relation to the performer. Therefore, acknowledging Johnstone's (2010) theories on proximity, it is possible for objects to be integrated into cognitive pathways to assist the audience in becoming more engaged in the performance through embodied cognition.

**Choreographic Process**

The creative methodology used in this project resonates with the use of scores in the work of choreographers such as Deborah Hay (2010) and Rosemary Butcher (2005) who balance improvisational structures with set material. The purpose of the piece was not to develop a codified movement language but to maintain a relatable human range of movement that the audience could read and connect with. This perspective resisted more codified dance to allow audience members to identify with the range of movement, as was explained in the previous section on mirror neurons. Butcher (2005) uses densely organized choreographic instructions that incorporate the skills of the dancer, without overtly displaying these skills in a dance vocabulary. For example, when describing one of her choreographic works, Butcher states, 'I keep it choreographic, without using a dance vocabulary of any sort […] it is still quite clear that these are highly trained dancers – from the ability to focus and to intensify minute detail' (2005: 202). Hay employs choreographic scores via exploratory means in studio and performative practice. Her written score in *No Time to Fly* dictates choreographic structure, but has freedom or choice for movement exploration to occur between individuals (Hay, 2010). This notion of choreographic scoring was used to develop a score comprised of sensations during the performances of *Planets* while allowing audience input to affect the dynamic, spatial and durational shifts.

This process was augmented by methodologies drawn from Authentic Movement and Body Mind Centering with a focus on cultivating a discerning internal witness in order to develop awareness of somatic states and to extract information from these states. Some studio sessions were guided by Roche's experience of working with Irish choreographer Joan Davis, who has extracted Authentic Movement[3] practices from its therapeutic frame to create performative happenings. Davis' research involves being deeply immersed in somatic states while attending to the movement of the body, by noticing and recording inner sensations for later articulation in verbal or written language.[4] In other sessions, Roche introduced somatic based methods for accessing embodiment and kinesthesia through visualization. Bonnie Bainbridge Cohen describes Body-Mind Centering as a 'study of movement that shifts traditional anatomical and physiological knowledge of the body to the actual physical and emotional sensation arising from different parts and functions of the body'

(2012: 1). Thus, the organ system became a focal point for sensory explorations as described by Cohen who suggests, 'organs are the primary habitats or natural environments of our emotions, aspirations, and the memories of inner reactions to our personal histories' (2012: 3). Organ movement explorations became the platform for reflecting upon, sensing, and observing the affect of internal sensations.

These internal movement investigations combined with the objective to enter heightened kinesthetic states in order to register internal movement pathways, which progressed through a number of choreographic phases through which Smith constructed four different scores that each had specific movement textures. For each one he set particular parameters. One of these states is described in the following figure:

| *Quality* | *Associated imagery/ descriptors* | *Placement* | *Sensations and observations* |
|---|---|---|---|
| Hollow | Light, breath, passage, fragile, pipe, precious, empty space | Skeletal | Floating movement along a linear axis. As if a fan was blowing from underneath, and I am carried by the air that rushes through my bones. Weightlessness. Stretch in the linear axis also-growing taller |

Initial movement explorations were built upon Smith's aim to connect with active audiences members on a kinesthetic level. Studio explorations thus became an integral dimension to familiarise with and register movement quality, tension, mobility and acceleration in kinesthetic states. Improvised movement processes were required to engage with the active audience as they contributed a degree of authorship to the movement itself. Process workshops tested the potential for audience response to and engagement with choreographed movement leading to explorations on how tempo and mobility could be sufficiently flexible to accommodate for the movement capabilities of a general audience. This extended to include focus on a rhythmical exchange of movement sensation. John Martin (1933) emphasizes the importance of rhythm, which he defines as the product of dynamic impulses in the muscles and argues for its existence in any and all movement, no matter how erratic or incidental. He claims it is 'the very root of the aesthetic experience' (Martin 1933: 122). This rhythmical exchange allowed Smith to establish a kinesthetic dialogue with participants, where certain social cues from audience members indicated when rhythmical shifts of sensation or theme were required to maintain high levels of engagement. For

example, when Smith performed sustained movement with the orb close to his body, the participants in short proximity manipulated themselves delicately around Smith, while participants in the outer ring were required to reach, and sometimes rise, to maintain their orb's connection. The movement quality and mobility required by the outer participants was greater in intensity than those at close distance. Therefore, when Smith sensed participants retracting from their reached position and disconnecting their orb, a decision was made to enter a traveling sequence that shifted spatial relationships while also transitioning into swinging movement. Combining spatial shifts with changes in movement quality acted as a rhythmical engagement strategy that varied audience perspective of Smith's movement.

Smith's objective to enter heightened kinesthetic states to register internal movement pathways was expanded on in the studio by using visualisation, imagination and intention (Ehrenberg & Wood 2010). Here, Smith constructed visualised landscapes through sets of ten-minute improvisations. This process involved constructing a specific landscape, theme or familiar place as visualised in the external environment. For the first five minutes of the improvisation Smith experienced embodied sensation as a body inside the visualised environment. These qualities and themes were then internalised to notice the difference between internal and external sensation. This method expanded the kinesthetic, sensorial experience, where the body became the environmental focus, where Smith was able to move clearly inside of himself. As an example, Smith detailed his experiences of the theme *Thickness.*

*I stand and notice how little room there is to move in this thick space. I am submerged, in a brown substance like mud or clay. I use the orb to carve air pockets that I slide into, and instantly I feel relieved at the sense of familiar atmosphere, something that I am not usually aware of […] It becomes an effort to step, as my whole body engages to manipulate the substance. My awareness is with the outer flesh and mechanics of movement as I pursue the most efficient way to move through this space […] I begin to gather the thickness through the pores of my skin, slowly I am filled by the room, so that now I am the environment to pursue movement within. An extreme muscular sensation hits me […] I move as one piece of flesh. The thickness becomes increasingly dense in the areas I bring the orb closest too, isolating the intensity of sensation […] Exhaustion causes me to throw the thickness out of my body […] I now notice how thin the air is. How heavy my bones are and how my muscles hang like sacks of flesh from them […] what is furthest from my body floats as its counterpart within my core works harder to keep it there. I crouch from exhaustion, where my weight is balanced and compact in this folded position.*

This process used visualisation to replicate the quality or theme in an external environment, so as to explore how the body moves inside of a particular quality. Then the internal theme was switched to explore how this quality moves inside of the body. The result revealed a hypersensitivity to all degrees of human movement. This process was continued with six different themes, including *precious galaxies, throw and catch, heavy, playful, eyes/viewpoint,* and *floor*.

Performances of *Planets* required a kinesthetic exchange between the participants and Smith, where choreographic intention shifted from choreographed movement to the sensations of movement in a collective group of movers. Throughout *Planets,* human bodies acted as the interface in an interactive system to allow audience members to become co-creators of the outcome. This design placed bodies at the centre of interaction and perception for both performer and audience member. The aim was to heighten embodied cognition in an audience through exposure to varied movement qualities, sensations and dynamics, as a way to share the experience of contemporary dance movement between the audience and dancer. Choreographer Carol Brown states dancers' training allows them to 'quickly drop into kinesthetic or somatic states, which go beyond rational thought, to readily sense the inter-subjective cues between each other' (2014: 19). Designing tools for audience members to enter into similar kinesthetic states was a means to increase the empathic transferal of movement sensation.

**Interactive Object: *Orbs***

Figure 1: Interactive Object *Orb.* Photo: Michael Smith

In *Planets,* the interactive technology is designed to present a proximity mechanism, where orbs held in the hands of audience members respond to short-range FM frequencies transmitted via the performer's orb. When in range, the orbs respond through visual and haptic feedback (light and vibration), acting as a calibration method for audiences to become more aware of thinking and perceiving through movement. This involved collaboration with interactive visual designer Andrew Bates, who designed and constructed the orbs in alignment with the unfolding choreographic process.

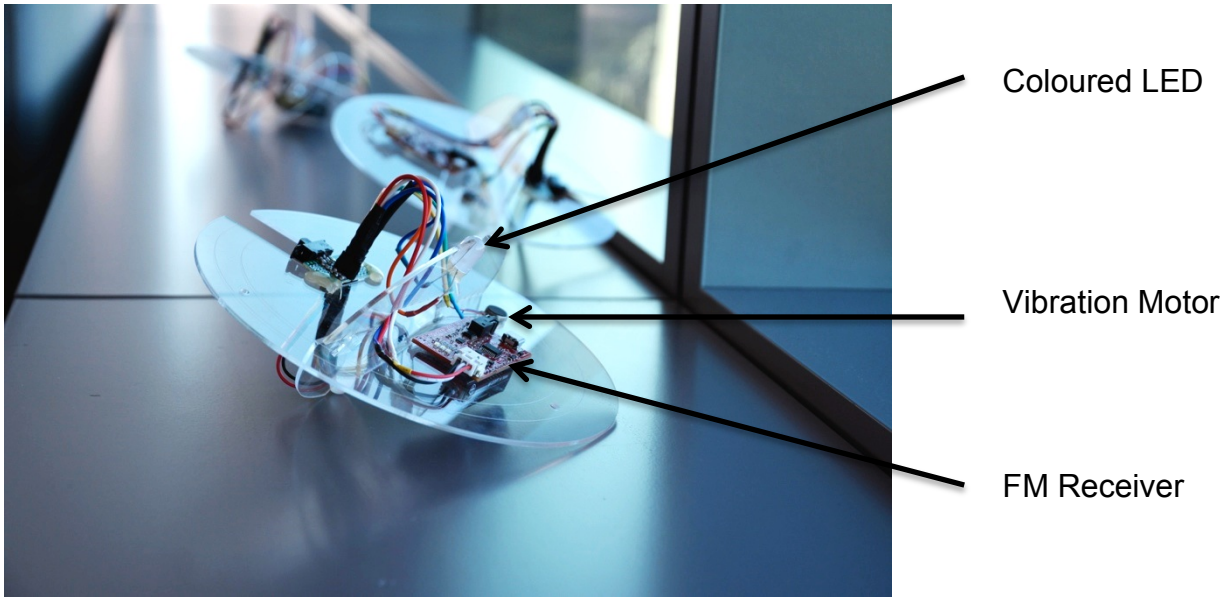

Figure 2: Internal, technical components of the *Orb.* Photo: Michael Smith

**Process workshop and focus group**

As outlined earlier, focus groups were used to collect qualitative data on interactivity, audience perceptions of kinesthesia and embodied responses. Research participant responses from the workshops determined the direction of studio practice. For example, participant feedback highlighted the importance for gesture and simplicity in the process of initiating movement in audience members. This movement related feedback was transferred into the studio to develop the choreography, where Smith created simple gestural greeting phrases with varied qualities. Although these choreographed phrases were not used during the performances of *Planets*, by recognising the importance of gestural movement to entice participation, Smith was able to enact the initial intention of the choreography rather than performing the choreography itself. Further to this, audience feedback was gathered via questionnaires following the performances of *Planets*.

The aims of the workshops were to test how participants might engage with the movement and the second stage prototype of the orb. Smith devised an improvisational score that segregated the space into movement themes and environments, which stemmed from visualised landscape explorations. The workshop findings posed key issues relating to the nature of interactive audiences. The first issue was managing the uncertainty in the audience member's role. In an attempt to expose the audience to the qualities of movement developed in the studio, the process of inviting audience members to become active participants of the work was overlooked. When interaction occurred, audience members seemed flustered and overwhelmed by the complexity of the movement and as a result were less inclined to participate. As one participant stated:

*'I felt a bit stiff, and thought "I am not good at this" […] I still endeavoured to maintain a connection with you (the performer)'.*

In a focus group that concluded the session, audience members gave feedback on ways to invite and encourage audience interaction with the performer.

*'The moments that worked most for me were when you slowed down the movement upon first interaction. So maybe you could come and stand next to me, and adapt my movements and encourage me to move from there. I would dance with you if you stopped and there was a bit more of a connection on a pedestrian level before you introduced dance movement. This shows us that you can move from our movements and that we don't have to just move with you'.*

*'I noticed at times your (the performer's) body language was telling us to follow you or to engage with you. Those gestures and direct movements made me feel welcomed in following you and to move'.*

This feedback highlighted the importance of establishing a clear set of objectives for the audience in the initial moments of interaction between audience members and performer.

The haptic feedback, or vibration, was an integral aspect that influenced the audience's attraction to maintaining a strong physical connection with the performer. Following a performance of *Planets,* one audience member stated,

*'Sensing the vibration stood out for me […] I was afraid to move far away from the performer as to not disconnect my orb from his. I wanted to stay connected to the mother planet (performer's orb)'.*

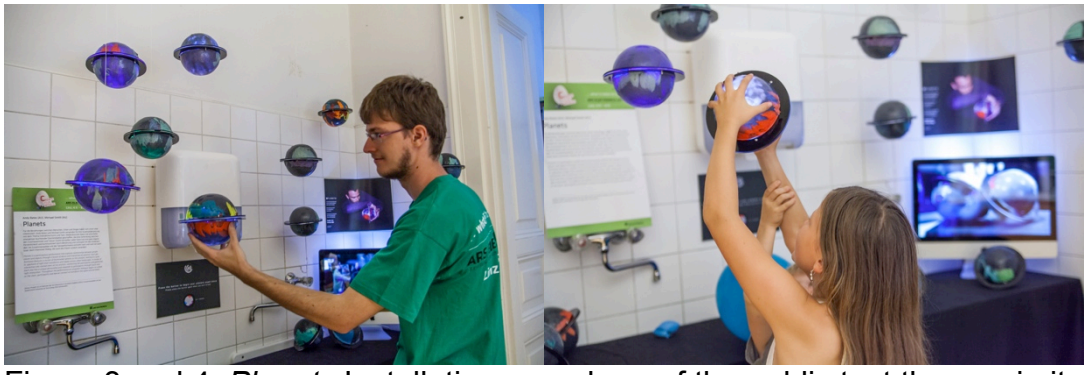

Figure 3 and 4: *Planets* Installation- members of the public test the proximity mechanism. Photo: Jazz Meyer and Adrian Spoljarevic

Figure 5: *Planets* performance: Performers *Orb* (white) surrounded by audience *orbs* experimenting with reach. Photo: Jazz Meyer and Adrian Spoljarevic

https://www.youtube.com/watch?v=oj9Ftqy3Mfs
Figure 6: Video trailer for *Planets.* Filmed at the Ars Electronica Festival, 2014. Cinematography: Jazz Meyer and Adrian Spoljarevic. Sound (shared performance space): 'Archifon III' by artists Tomas Dvorak and Dan Gregor

**The performer's account of *Planets***
*Ars Electronica Festival, Austria. September 4, 5, and 7, 2014*

*The performances of Planets revealed the essence of the piece in an unexpected manner. On the first night, in a crowd of 1,500 people, 20 orbs were distributed to form a cluster of participants. Without instruction, I approached the first audience member with an orb in hand. As the performance site lacked sufficient space to perform the choreography I lingered near a participant to instigate the orb's vibration via the proximity mechanism, with the objective to initiate conversation in movement. A collective formed after connecting with each orb, where I led the group through simple, improvised movements that swayed, bounced, and crouched in a circular, delicate, fluid movement quality that felt natural in accordance with the characteristics and build of the orbs. This moment revealed the essence of the piece as an enjoyment of connecting and moving with others. The proximity mechanism enabled a sense of embodiment without the need for linguistic or verbal instruction and allowed people to connect and move within range.*

*During a second performance I experienced being present, hyper-sensitised, and in the self but also out with the audience: I begin still, kneeling, looking down and sinking into gravity. I position myself so that I exist in the gaze of onlookers, and as I perform introverted movement that manifests from being absorbed internally, I consciously aim to maintain their attention. As a performer, I am used to being watched from a distance and recognise this feeling of engaging with a passive audience. But as audience members*

*approach me, my role shifts to a position that is more foreign. I use intuition that has been built and refined upon in the studio practice to understand the reactions and outcomes that I now initiate in others. Over time, my solo becomes a duet where we intently sense who is leading and who is following. Judging social cues becomes an objective to maintain the audience's interest. I rhythmically shift between swinging and circular movements, pauses, level shifts and travelling runs to challenge the audience's ability to keep up; 'how far can I take this?' I no longer sense audience participants watching me, because their gaze is fixed upon their orb. Instead, I feel them moving with me. Through my intention to lead the audience, I initiate a swing and they follow. A participant's arm veers across my torso, so I shift. My head falls behind centre and my spine adjusts to the anatomical normality that is most familiar. In this moment my initial swing correspondently informs the action of a participant, which then determines my response to them. I move and they follow, they move and I follow. I feel vulnerable being so close to the audience, as I have to trust and be open to sharing a moment with complete strangers. The success of this and to feel trusted as a leader or performer feels exciting and liberating in return. This piece relies on active participants to develop and expand on the potential of what is happening and where it can go. This is shaped by the unpredictability of how the individuals will respond once they are in the work.*

*For the duration of each interactive performance I established rhythmical and sensorial shifts. For example, I began with fluid, stable movements, to then fall and enter into a run. Incorporating rhythmical variation on sensation highlights the somatic, kinesthetic responsiveness that was created within the group, as each shift in sensation was formed and reformed by the participant. The dark atmosphere of the night allowed people to connect inwards, while light from the orbs acted as a visual focal point guiding where to be situated in relation to others. To conclude each performance, I placed my orb on the floor, and those who remained followed. We stepped away slowly, facing the pile of orbs that had accumulated on the floor before facing each other with applause as a final thank you. This through-line established a definite beginning and end. Planets became a live, group choreography where audience and performer were engaged by the interactive technology in a shared goal.*

**Audience Feedback**

Audience feedback obtained through questionnaires that followed performances gave alternate perspectives to the experiences of being a participant of *Planets*. An audience member stated:

*'The dense sensation within the group caught my attention […] people being excited is a beautiful thing to experience and to be aware of. I felt comfortable moving with the performer because he spread a generous atmosphere […] my orb acted as my own checker on the checker board, my piece of the board-game'.*

Another participant spoke of the 'orb' as:

'*My tool that allowed me to dance and improvise with the group*'.

## Conclusion

Audience feedback suggested the *orbs* allowed audience members to feel comfortable and excited when moving together in this public space. *Planets* highlighted the benefits of implementing kinesthetic empathy principles when connecting with an interactive audience in such contexts. This research began with an inquiry into the ways in which kinesthetic empathy theories can inform choreographic decision-making to enhance the relationship between the performer and audience member in interactive performance. Findings regarding kinesthetic empathy and the mirror neuron system informed creative decision-making throughout studio explorations of movement and the choreographic process. This generated a platform of theoretical and physical knowledge that informed Smith's decision-making during the performances of *Planets* and was a means of developing possible future directions for a high degree of audience involvement in dance works.

The interactive system in *Planets* was built upon knowledge of the fundamental relationship between movement and the environment as defined by Sheets-Johnstone (2010). By using proximity as a spatial concept to instigate kinesthesia and the capacity to think in movement, audiences were given the possibility to be drawn by the interactive system into a relationship to the performer and inspired to move. This was facilitated through the proximity mechanism as a calibration method. The result offered new possibilities for audiences to experience an interactive contemporary dance performance. *Planets* therefore became a platform that allowed kinesthetic transferals of movement sensation to exist between the performer and audience members. To enable this co-authorship of movement in live choreography, Smith was required to enter into a dual mode of perception. This involved remaining in a somatic state to sense internal movement qualities, while being externally present with audience members who correspondently embodied the sensations imbued through the movement. This exploration into kinesthetic empathy theories resulted in the creation of a work that, at its core, united people through the spontaneous exchange of moving together in a public space.

## Notes

1 The Ars Electronica Festival brings together arts, sciences and technology. Events range from conferences and speeches to exhibitions, concerts, performances and interventions. The settings of these artistic-scientific explorations are various cultural institutions and art venues as well as public space throughout the city of Linz, Austria (Ars Electronica, 2014).

2 A system consisting of a programmable FM receiver that can decode audio control tones and RDS commands sent from a central FM transmitter (Ars Electronica, 2014).

3 Authentic Movement is a form of movement therapy, which in recent years has been utilised by dancers to enhance performance skills, see Pallaro (1999).

4 For more information on Davis' work, see Meehan (2010).

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**Biographies**

Michael Smith has recently obtained a First Class Honours in Dance from Queensland University of Technology, in the domain of performed movement and choreography. His keen interest for interactive technologies in performance contexts led to his ongoing enquiry into perceptual mechanisms of movement to understand the embodied relationships between performer and audience members. Michael works as a freelance dancer and choreographer based in Brisbane, Australia and has performed in a variety of national and international festivals. These range from Anywhere Theatre Festival and Crack Theatre Festival, to Beijing Dance Festival (Beijing, China) and the Ars Electronica Festival (Linz, Austria). His most recent developments include a choreographic lab with the Aboriginal Centre of Performing Arts, and Gaga Technique Workshops with Batsheva Dance Company and STRUT dance.

Originally from Ireland, Jenny Roche is a Lecturer in Dance at Queensland University of Technology, Brisbane. Her current research focus is the creative practice of the contemporary dancer, exploring the specific nuances of this role from multiple perspectives including philosophical approaches, somatics, and narrative inquiry. She has had a career spanning over twenty years in dance, working with a range of choreographers including Michael Keegan-Dolan (Fabulous Beast), Janet Smith, Rosemary Butcher, Jodi Melnick, John

Jasperse and Liz Roche with whom she still occasionally dances, most recently performing ‘Shared Material on Dying’ at Dance Exchange, Birmingham and in ‘Body and Forgetting’ at the Abbey Theatre Dublin. From 2007 to 2011 she was the dance advisor to the Arts Council of Ireland and completed her Ph.D. at Roehampton University in 2010. Her forthcoming book *Multiplicity, Embodiment and the Contemporary Dancer: Moving Identities* will be available in 2015.